

South Old River Salinity Transect Study Brief

Draft Mid-Term Update, August 2009

This draft mid-term update presents South Old River Salinity Transect data collected during the first half of 2009. The goal is to give interested parties a brief of the study to date with limited analysis of apparent trends. A final report next year will incorporate all data with more detailed analysis.

Conclusion: The highest conductivities in south Old River were consistently measured within a stretch of river west of the Tracy Boulevard Bridge compliance station, although smaller-sized zones of elevated conductivity were periodically present near or upstream from the compliance station. Substantial conductivity increases in south Old River were not apparent at the confluence of Paradise or Sugar Cuts.

Background: Past studies have shown that salinity in south Old River is consistently higher than in the San Joaquin River at Vernalis. Several sources were identified as contributors to the higher salinities including agricultural drainage, point-source discharges, and groundwater effluence (Sources of Salinity in the South Sacramento-San Joaquin Delta, DWR 2007). Salt augmentation by these sources (and other contributory factors such as diversions and evaporation) has periodically raised conductivity at Tracy Boulevard Bridge on south Old River (compliance station) above the D-1641 water quality objectives.

Objectives/Methods: One of the observations made in “Sources of Salinity...” was that the compliance station at Tracy Boulevard Bridge appeared to be affected by one or more local saline sources. The current study was initiated to investigate this potential and other salinity trends in south Old River. Salinity transects were made by boat every other week using a YSI conductivity probe and logger merged with a hand-held GPS unit logging latitude-longitude coordinates. Transect data was graphed using the ESRI software ArcGIS 9.3. To ensure comparability between sampling dates, transects were conducted on an outgoing tide. Transect boundaries extend from the confluence of Middle and Old Rivers in the east to just before the approach channel to Jones Pumping Plant (Figure 1). Figure 1 also shows the location of diversion and discharge structures identified during boat runs using a hand-held GPS unit. Transects were also performed on Paradise Cut, a long waterway intersecting south Old River just after the Grant Line Canal bifurcation (Figure 1).

Results: Figure 2 shows south Old River salinity transects from 10 completed runs. Conductivity was generally higher during the first six runs (more red and orange) than the last several runs (more green). The greener runs reflect lower salinity water from the San Joaquin River during the spring pulse-flow period. One common trend between runs was a decrease in conductivity at the western end of the transect boundary which was likely due to the influx of lower-salinity cross Delta water with flood tide. All runs were made with no temporary barriers installed.

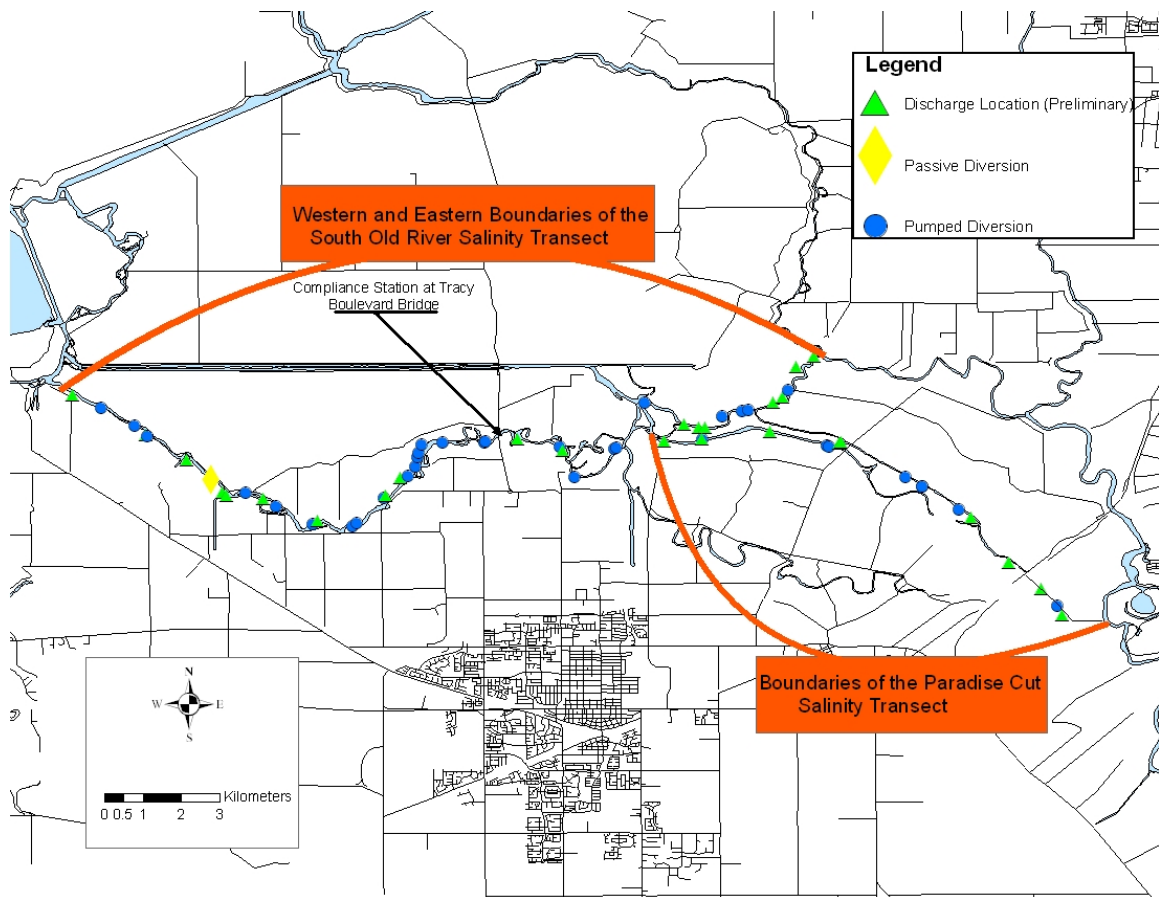


Figure 1. Boundaries of the south Old River and Paradise Cut salinity transects

All transects showed zones of elevated salinity – slugs of saline water moving downstream with tide. Although a few of the high salinity zones were located upstream or near the compliance station (1/29, 2/25, 3/16, and 4/16), the largest zones of elevated salinity were situated further west. To better visualize the zones of elevated salinity within each run, conductivity measurements were converted to percent of total values and plotted in Figure 3 using the same color-coded scheme.

Figure 3 shows the percent of total conductivity within each run. The figure provides greater visual resolution of salinity changes within each run without the need for multiple individual legends. Similar to the previous graph, Figure 3 shows isolated zones of elevated salinity upstream and around the compliance station. The highest conductivities were consistently located within a stretch of river several kilometers downstream from the compliance station. A definitive explanation for this trend cannot be provided at this time. It's possible that a combination of factors are involved such as the cumulative effect of multiple discharges/diversions, an enlarging channel and subsequent slowdown in net downstream flow, and several high volume inputs (agricultural and groundwater) co-located with these zones of highest salinity. With a few possible exceptions, substantial increases in conductivity on south Old River were not apparent around the confluence of Paradise or Sugar Cuts.

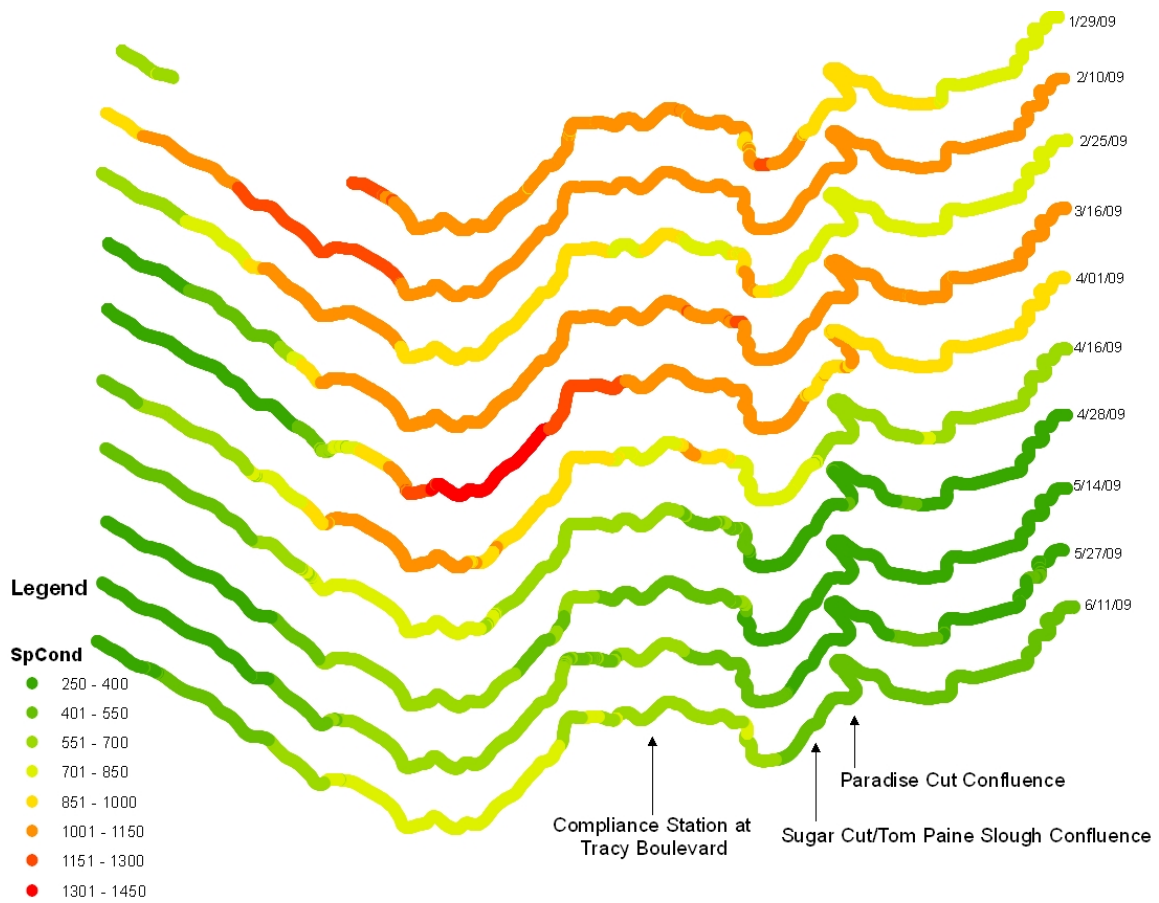


Figure 2. South Old River salinity transects, 1/29/09 to 6/11/09

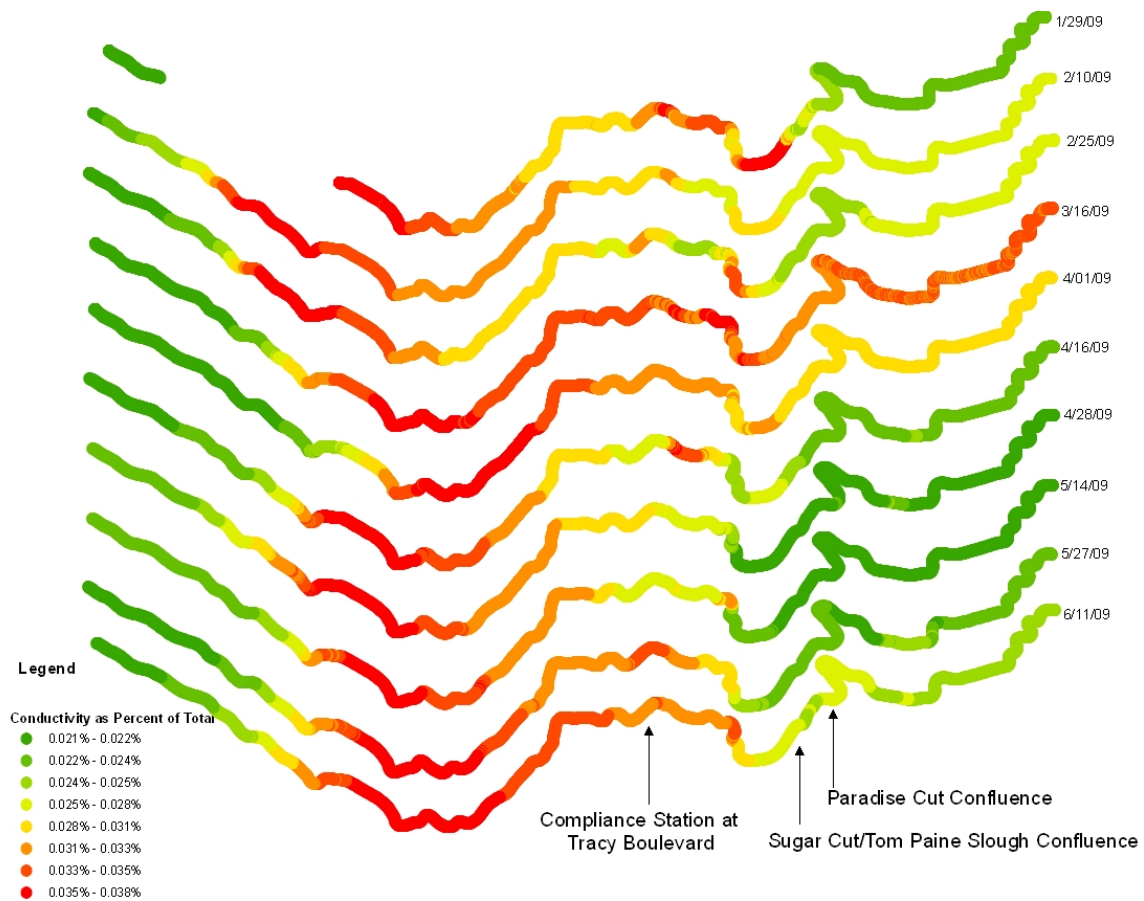


Figure 3. South Old River salinity transects in percent of total for each run, 1/29/09 to 6/11/09

Transects along Paradise Cut (and one from Sugar Cut with a unique scale) show the highest conductivities reside in the upper reaches of the waterway (Figure 4). This higher salinity water is diluted out as it moves downstream toward Old River with tide. Preliminary mineralogical analyses indicate that the elevated conductivities in upper Paradise Cut are associated with saline groundwater accretion. Conversely, the higher conductivities in upper Sugar Cut appear to be associated with a surface water source composed of commingled groundwater and agricultural waters.

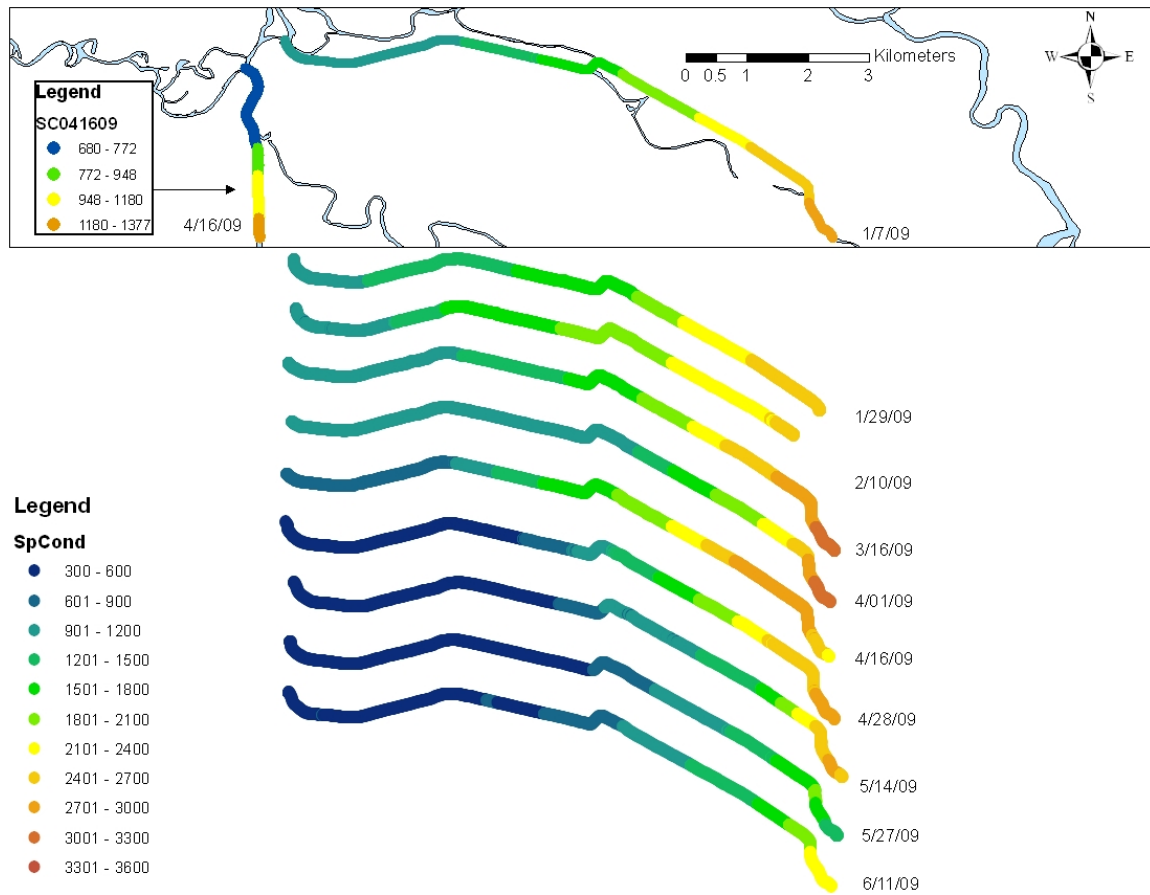


Figure 4. Paradise Cut salinity transects, 1/7/09 to 6/11/09, and Sugar Cut salinity transect, 4/16/09 (SC041609, above left with separate color-coded scale).

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